Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 11. July, 1909. No. 127.

NOTES ON THE FLORA OF LOWER CAPE COD.

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During the years 1906, 1907 and 1908 I was in the town of Eastham, Massachusetts for longer or shorter periods from April to September, and while flowering plants were not the principal object of my observations, I made the attempt to record and collect specimens of all the species that I noticed. The resulting list, while not containing many notable rarities, shows curious limitations and other peculiarities, and though the full list is not worth printing, some notes may be of interest to readers of Rhodora.

In the trip from Boston to Cape Cod, a gradually increasing sandiness of the soil is noticeable, from Middleboro on; this increase is nearly uniform all the way; at Provincetown, at the extreme end, it is not so striking to the traveler, as the latter comes to a compact town, the houses with little lawns and gardens; but all the soil for these lawns and gardens was brought from more fortunate places, and over the ridge that lies back of the town is an expanse of sand as desolate as any desert in Asia. At Truro, the next town up, the desolate character is most manifest to the ordinary traveler, the sand cliffs and dunes being unrelieved by any town, only by scattered houses here and there. Eastham is about twenty miles from the tip of the Cape, and while the scenery is not so impressive as that in Truro, the conditions must be practically the same as to vegetation, and its flora may be considered as fairly representative of lower Cape Cod.[1] The town is six miles long, two to three miles wide; the eastern side is all composed of larger or smaller sand dunes, a somewhat higher bluff facing

[1] By lower Cape Cod is here meant the part beyond the elbow at Harwich; upper on the map, but lower as being farther from the mainland.

the ocean, with a narrow, sharply sloping beach of coarse, loose sand at its base. The sea is continually eating away the base of this cliff, carrying the material out to sea, and building shifting and dangerous bars off shore. The western side of the town is flatter, apparently largely salt marsh covered with sand; near the shore it is still marsh, and the water is very shallow for a long distance, not reaching a depth of 18 feet until five miles from the shore. This shore of the Cape seems to be gradually moving to the west, the increase here probably compensating for the loss on the east shore. On this side of the town there are a few small brooks, apparently on the lines of the salt water creeks of the former marsh; but in the eastern part of the town there is absolutely no drainage system; the surface is dotted over with rounded depressions of all sizes and depths, with steep slopes, which quite cut them off from each other, so that there is no connection whatever between them. What vegetable matter there is collects at the bottom of these hollows, which vary in size and depth, from a shallow depression a few yards in diameter, with the grass greener at the bottom than on the surrounding surface, to large and deep ponds. In the richer ground at the bottom of the smaller hollows, and around the swamp or pond in the larger, are to be found species that could not exist on the barren sands above. There being no connection of one such hollow with another, each has a character of its own, interesting species being often found in one such hollow but not in others near by. Collecting in this region is wearisome, as one must continually climb up from one hollow to go down into the next; and there is a curious loneliness in these hollows, nothing in sight beyond their edge, and few sounds to be heard other than the wind and the surf. The climate is, on the whole, milder than that of the vicinity of Boston, extremely low temperatures being unusual in winter, and the wind from either the ocean or the bay tempering the heat of summer. The poverty of the flora is due to soil conditions, not to climate.

The plants may be roughly classified into four groups; those of general distribution, which one sees everywhere on the sandy roads and fields; marine species, growing in places under the influence of salt water; domestic species, living in the neighborhood of houses and barns; and "specialties," species to be found only in particular, limited stations. The marine species, those of the beaches and marshes, are practically the same as in the vicinity of Boston, the conditions

being about the same; *Salicornia ambigua*,[1] however, rare near Boston, is here as common as *S. europaea* and *S. mucronata*. *Solidago sempervirens* is very luxuriant, the heads being sometimes double the size of any I have seen in Essex or Middlesex. *Ammophila arenaria* is omnipresent on the sand dunes, and around the clumps one often sees the curious arcs of circles traced by the leaves, whipped about by the wind that seems always to blow there.

The domestic species do not differ much from those of more favored localities, but some of the more delicate or exac ing ones are absent. There are balm of Gilead trees near every house, and near the older houses lilac bushes. At the place where I lived the lilac bush was as large as a small house, a dense thicket of stems below, a mass of leaves and flowers above; the catbird built its nest there, while the birds of the barnyard found it an excellent roosting place by day or night. *Leonurus Cardiaca* was about all the old barns, and *Marrubium vulgare*, equally common, seemed to take the place of catnip, which I saw nowhere. *Saponaria officinalis* and *Pastinaca sativa* were common, and *Malva rotundifolia* formed a narrow strip close to the walls of the houses and barns, seldom going far from them; *Tanacetum vulgare*, usually var. *crispum*, could often be found in places where now there was no apparent sign of human life, but in every case a search would show some old well or other indication that a home had once been there. The tansy seemed never to stray beyond the boundaries of the old yard, though the fence had gone a hundred years ago. On the slope of a hollow near my house there came out, after a rain, a carpet of little red, white and yellow stars; *Anagallis*, flowers about normal; *Mollugo*, flowers exceptionally large; *Potentilla*, flowers unusually small; so that all the flowers were nearly of a size.

The species of general distribution, those that one would notice along the road or from the train window, are comparatively few, but each represented by many individuals. The first to attract attention in spring is the beach plum, *Prunus maritima*; it is a rather dense shrub, growing by roadsides or in fields, seldom as high as a man's head; before the leaves appear it is covered with white flowers the whole length of the branches, so closely set that one can hardly touch the branch between them. In late summer and early autumn the fruit ripens, about as large as a small cherry; it is at first pale green,

[1]As the names of plants mentioned in these notes are those used in the seventh edition of Gray's Manual, I have not thought it necessary to add the authors' names.

then waxy yellow, pink, red, purplish, and finally almost black; all these shades at once in a small bush, sometimes covering it as completely as did the flowers in April or May; it is a most attractive shrub, and the fruit, prepared by some native Cape Codder, makes delicious pies and preserves. In May and June the lupine abounds, growing in dense clumps on sandy stretches; it seems even more luxuriant than in more favored stations, and the racemes range in color from nearly true blue to pinkish purple. In stations too desolate even for the lupine the Hudsonias abound, both *H. tomentosa* and *H. ericoides*. They usually grow in dense clumps, each a single plant, the branches twisted like a Japanese dwarf tree; often there is nothing but bare sand between the clumps. When the wind blows, as it almost always does in Eastham, the sand drifts and catches among the branches of the *Hudsonia*, forming a dome-shaped heap inside the clump, sometimes only the tips of the branches projecting; in such cases the plant, without enough leaf surface free to maintain its life, throws all its energies into a dense and brilliant coating of yellow flowers. The bearberry, *Arctostaphylos Uva-ursi*, is very abundant, the shining leaves carpeting large stretches of sand; the wild carrot, *Daucus Carota*, is everywhere in the fields; in summer and early autumn *Chrysopsis falcata* abounds, with its own particular shade of yellow. *Corema Conradii* is frequent and showy in spring, but not so general as the other plants just mentioned. Few species of trees occur, but the pitch pine is everywhere, forming dense forests of stunted individuals; some fifty or sixty years ago it was planted extensively in the most barren places, and one can still trace the regular rows in which it was set out. Now it is continually spreading, covering large areas that were cultivated fields fifty years ago. Black snakes are plentiful among the pines, and have the pleasing habit of hanging by the tail from a limb, looking like a broken branch until you come in contact with them. The locust, *Robinia Pseudo-Acacia* is common, evidently long ago escaped; there are some scrub oaks, but few other trees. Of cryptogams other than algae, there are few noticeable species. In moist places are often stretches of densely packed *Woodwardia virginica*; common brake grows under the pines; other ferns are not much in evidence. Trees and fences are often completely covered with a lichen of the bright yellow that one sees only near salt water; crisp Cladonias alternate with the blackberry vines in the fields, but there are no rock lichens, as there are no rocks to support them.

Fleshy fungi vary in frequency; in damp seasons there is sometimes a most abundant growth of *Amanita muscaria* and one or more species of *Boletus*, all through the pine woods; giants, all of them.

The three classes, marine, domestic and general, include only a minority of the species noted; more were found in special limited stations. There is absolutely no drainage in the eastern part of the town, and in each pond or swamp, within its own hollow, lives a flora independent of the others and with a character of its own. The water was very low in the summers of 1907 and 1908, and there was an excellent chance to study the floras of these neighboring but isolated stations. Meeting-House Pond may be taken as an example; *Castalia odorata* was plenty; at times the water was so low that the dry leaves crackled under my foot as I walked near the shore; its duplicate in miniature, *Nymphoides lacunosum*, floated in a band, a short distance from the edge. *Pontederia cordata*, *Lobelia Dortmanna* and *Eriocaulon septangulare* covered quite a zone, from where the water had been in the spring, to some distance below its summer level. Around the blue water was a broad belt of white sand, like the cornea about the iris; this was variegated by vines of flowering cranberry, and geometrical patterns made by a prostrate purple grass. *Hydrocotyle umbellata* grew where there was any shade, *Gratiola aurea* and *Xyris caroliniana* were plenty near high water line. In July, all around the pond, among the grass, was the beautiful *Sabatia dodecandra*; I did not find it at any other station in the town; as this passed away, its place was taken by *Coreopsis rosea*, and in late summer two white Eupatoriums, *E. hyssopifolium* and *E. perfoliatum*, formed adjacent concentric rings, the former on the inside. No other pond had just this combination, and each had some special character of its own. One was fairly alive with *Myriophyllum tenellum*, which was absent from the others; another made a specialty of *Potamogeton*, which was lying in great windrows on the shore.

The limitation of species to single localities makes it rather unsafe to say that any species does not occur in Eastham, but I feel sure that any species I did not see, if occurring at all, must be rare. As species of single stations may be noted, among others, *Apios tuberosa*, *Vitis labrusca* and *Spiraea tomentosa*; *S. latifolia* was not seen at all. *Epilobium coloratum* and *E. adenoclaulon* were found, but no *E. angustifolium*. *Asclepias incarnata* var. *pulchra* was not uncommon, *A. amplexicaulis* was generally distributed, *A. tuberosa* I saw once only;

farther up the cape it is abundant, and there was no *A. syriaca.* Of *Solidago* I saw only five species; *S. sempervirens* already mentioned, *S nemoralis* in dry fields, *S. tenuifolia* common by roadsides, *S. ulmifolia* once near a swamp, and *S. odora,* common in fields. *Hieracium* was represented by *H. Marianum, H. venosum* and *H. Gronovii,* all common; no introduced species were seen. There was an abundance of *Antennaria* in the fields, varying much in size and appearance, but it proved to be all *A. plantaginifolia. Gerardia paupercula* was the only representative of that genus; *Ranunculus repens* was the only crowfoot, and that I saw only in one station; the *Ranunculaceae* in general were poorly represented. I saw no *Oenothera* except *O. muricata*; there was a much condensed form of *Cirsium pumilum* and some fairly good *C. discolor,* but no *C. lanceolatum* nor *C. arvense*; it speaks much for the poverty of a soil when it will not support Canada thistle. Of the *Saxifragaceae* I saw only a few plants of *Ribes oxyacanthoides,* and the *Cornaceae* were quite unrepresented. So were the genera *Rudbeckia, Arctium, Geranium, Thalictrum, Anemone, Aquilegia, Berberis, Desmodium* and *Crataegus.* In riding on the train to Boston it is interesting to notice, one after another, the appearance, often in abundance, of the species lacking in Eastham; a great patch of *Thalictrum* in Brewster; *Rudbeckia* in Harwich, and so on. I would have added succory as appearing near the old glass works in Sandwich, but for one plant that I found in Eastham in what had been a strawberry bed, but now run to weeds; beside it were two tall blackberry bushes, the only high blackberries in the region, where the common blackberry is *Rubus villosus* var. *humifusus,* lying flat on the ground and working havoc with shoes and stockings, but supplying what seems to me the finest fruit of all the blackberries, large grained, sweet and juicy. The flat artificial level of another deserted strawberry patch was a dense mass of *Verbena hastata,* as high as a man's head; I did not see this species elsewhere in the town. Even as regards weeds there are peculiarities. A few stunted plants of *Amaranthus retroflexus* and *A. graecizans* were the only representatives of the genus; occasional plants of *Anthemis Cotula* and *Linaria vulgaris* were to be seen, but they were by no means common. *Artemisia Stelleriana* abounded along the shore, *A. caudata* everywhere; the latter species seems at home in sand inland as much as at the shore. Some of the more recent importations in weeds were well established; *Bromus tectorum, Brassica arvensis* and *B. juncea, Sisymbrium altissi-*

mum as well as the old *S. officinale* var. *leiocarpum*. *Euphorbia Cyparissias* had spread from old gardens, and in many cases had bracts of a very deep orange, brighter than I remember seeing elsewhere.

The family *Cistaceae* seemed to find conditions fairly comfortable, as *Helianthemum canadense* and *H. majus*, *Hudsonia tomentosa* and *H. ericoides*, and *Lechea maritima* were all abundant. Of the *Iridaceae*, *Iris versicolor* was not uncommon; *Sisyrhinchium angustifolium* and *S. atlanticum* seemed about equally frequent. Of *Liliaceae* I saw only *Lilium philadelphicum* (in 1906 only; 1907 and 1908 were dry seasons and it did not appear), *Smilacina stellata*, *Smilax rotundifolia* and *Asparagus officinalis*, the last escaped from cultivation and common. In nearly every family curious absences could be noted, which it would take too long to detail. I secured only six species of *Carex*, three of *Cyperus* and six of *Juncus*; evidently the locality is better suited to *Juncus* than to the others. Violets were not common, but in one place I found *Viola fimbriatula* growing and fruiting freely in pure quartz sand, no other plant in its vicinity but *Ammophila*. The common *Oxalis* was *O. stricta*, with large flowers of a deeper yellow than in *O. corniculata*, our usual species near Boston. The most showy flower was *Hibiscus Moscheutos*, whose large, Hollyhock-like flowers seemed strangely out of place in their impoverished surroundings.

It remains to mention a few species, whose occurrence here is of definite interest. Along the roadsides all through the town, was a plant with dense tufts of gray-green linear leaves, which in early summer bloomed and proved to be the old-fashioned garden pink, *Dianthus plumarius*. It does not appear in the Manual, but is evidently quite at home here. *Trifolium dubium*, not a common plant generally, was not infrequent. The only *Amelanchier* was the rather unusual *A. oblongifolia* var. *micropetala*; *Plantago aristata* var. *Nuttallii*, a form not mentioned in the Manual, was not uncommon in dry fields. In Rhodora, Vol. XI, p. 58, will be found mention of a small *Aster* which I found here, which has proved to be of interest in settling a doubtful point as to *A. surculosus*; and the occurrence here of *Agropyron pungens* considerably extends its range, and probably establishes its title, which has been disputed, to native American citizenship. The finding of *Lactuca Morssii* also extends a range, in this case of a "Rhodora species." In closing this list of species, I must add the consecrated formula. "Through the kindness of Prof. Fernald of the

Gray Herbarium the specimens in question have been identified" etc., etc. In this case the number of specimens was large, the proportion of interesting ones small, and more than the usual thanks are due for the work involved. All the specimens have been incorporated in the herbarium of the New England Botanical Club.

What general conclusion, if any, can be drawn from these notes? In Eastham the conditions of sterile sandy soil, lack of drainage or water courses, remoteness from active human influences, and increased influence of saline conditions are carried to an extreme, as compared with the region near Boston, with much the same climate; and we find: — within the range of salt water, practically the same flora; strictly aquatic plants, practically the same; domestic plants, not cultivated but thriving near cultivation, largely the same but keeping close to house or barn; weeds, many absent, a few, *Spergula* for instance, more abundant than usual, but most species in a reduced form; trees few and stunted but covering much ground; few fruit-bearing plants, but two, the beach plum and the low blackberry, luxuriant and with delicious fruit; herbaceous plants with few species but often many individuals, grasses, sedges and rushes especially few species; of the larger families *Cistaceae* and *Leguminosae* apparently best represented, *Labiatae*, *Ranunculaceae*, *Cornaceae* and *Saxifragaceae* with poorest representation; ferns, fungi and lichens, not strong; algae, marine and fresh water, well represented. On the whole, probably not half so many species as would be found in Swampscott, Cohasset or any similar seashore town near Boston. Poverty everywhere when out of reach of fresh or salt water.

Is time likely to bring any change? It is hard to say, but when we compare the desolate appearance of the town today with the accounts of what it has been, it seems to be going to the bad generally. As a boy I remember great fields of corn and rye where now are only dense woods of pitch pine; I have seen linen cloth, spun and woven on the spot, from flax raised there. Of course much of this change is due to changed social conditions; a farmer's family can no longer produce most of what it needs; work is specialized, and two or three acres of asparagus, tended by one man for three or four months of the year, now bring more actual money to the family than the whole labor of a family on a large farm did in the old times. But for the town as a whole, the diminution of fertility has been marked. In the History of Eastham by the Rev. Enoch Pratt, published in 1844, changes

of this kind are noted. Speaking of a part of the town he says, "This barren tract, containing about 1700 acres, which now has hardly a particle of vegetable mould, formerly produced wheat and other grain." But of the part of the town under cultivation he says "The raising of grain is the principal business to which farmers attend. More corn is produced than the inhabitants consume. More than a thousand bushels are sent to market, and in years past more than three times that quantity has been exported. This is the only town in the county that raises sufficient for its own consumption." No grain whatever is now raised. "Except a tract of oaks and pines adjoining the south line of Welfleet, and which is about a mile and a half wide, no wood is left in the township. The forests were imprudently cut down many years ago, and no obstacle being opposed to the fury of the wind, it has already covered with barrenness the large tract above described, and is still encroaching on other parts." The pitch pines are now covering not only the deforested area to which he refers, but also much of the ground which produced the grain for export. The sand no longer blows over this area, and in time, probably a long time from a human point of view, vegetation might find more favorable conditions, but a new element has entered the problem, of which the Rev. Mr. Pratt never dreamed. Every year wood fires are started by sparks from the locomotives, often killing the trees over hundreds of acres, and what is worse destroying all the leaf mold and other vegetable matter that has accumulated, so that it is doubtful if another growth, even of pitch pine, is possible. On the whole, it seems probable that less favorable rather than more favorable conditions are to be looked for as to the plants of general distribution. The little local floras of the ponds, however, will probably long continue.

Malden, Massachusetts.